In the United States Patent and Trademark Office

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First Inventor:	Mark C. Peterman	Docket:	AL001
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For:

Localized chemical microgradients

Amendment under 37 CFR §1.114

Commissioner for Patents
Via EFS Electronic Submission

Sir:

In response to the Office Action mailed 05/27/2010, the following reply is respectfully submitted.

In the Claims

Please amend the claims as follows:

1. (currently amended) A device for creating microgradients in solution comprising:

a microfluidic channel with openings at each end and two or more apertures in the channel walls;

two and only two electrodes: a first electrode placed in or near a first opening at a first end of the channel, and a second electrode placed in or near a second opening at a second end of the channel; and,

an electrical power supply connected to the electrodes; wherein,

the apertures are <u>continuously</u> in contact with an external fluid bath while the openings are isolated from the bath.

2. (original) A device as in Claim 1 wherein the power supply is connected to the electrodes such that several distinct current paths exist from one end of the channel to the other and current flows along all of these paths when an electric field is applied along the channel by the combination of the power supply and the electrodes.

3. (original) A device as in Claim 1 wherein the power supply is connected to the electrodes such that simultaneous flow of fluid occurs

through two or more of the apertures and a chemical concentration gradient is formed near the apertures.

4. (original) A device as in Claim 1 wherein the length of the channel is between about ten microns and ten millimeters, the transverse dimension of the channel is between about 0.1 and one hundred microns, and the dimensions of the apertures are between about 0.1 and ten microns across.

5. (original) A device as in Claim 1 further comprising structures that form indentations in the channel near the apertures, such indentations being approximately the size of a living cell.

6. (withdrawn) A method of creating microgradients in solution comprising:
providing a microchannel having two or more apertures;
filling the microchannel with a solution;
providing a bath in contact with the apertures of the microchannel; and,
applying an electric field along the microchannel.

7. (withdrawn) A method for positioning or sorting cells comprising:

providing a microchannel having two or more apertures to a bath;

applying an electric field along the microchannel;

introducing cells in solution into the microchannel; and,

moving the solution and the cells by electroosmotic flow until electric current flow along the channel drops essentially to zero.

8. (withdrawn) A method of delivering reagents to cells comprising:

providing a microchannel having two or more apertures to a bath;

applying an electric field along the microchannel;

introducing reagents into the microchannel; and,

positioning cells in the bath near the apertures.

9. (currently amended) A microfluidic device comprising:

a microfluidic channel defining a flow path for a fluid having a known concentration of a selected chemical, the microfluidic channel comprising a plurality of apertures defined in the channel for providing <u>continuous</u> fluid communication between the channel and a reservoir containing a sample solution, and an inlet and an outlet that are isolated from the reservoir;

electric field means provided for inducing electroosmotic flow along the flow path, wherein the electric field means comprise a number of

electrodes that is less than or equal to the number of apertures; and,

means for applying pressure to the fluid in the flow path such that fluid flows simultaneously out of the channel at the apertures and forms a concentration gradient at the apertures along the channel such that cells cultured near each aperture are exposed to a separate concentration of the chemical corresponding to the location of the aperture along the concentration gradient.

Remarks

Claims 1 – 9 are pending.

Claims 6 – 8 have been withdrawn from consideration.

Claims 1 – 5 and 9 were rejected.

Claims 1 and 9 have been amended.

Claim Amendments

Claim 1 has been amended to clarify that apertures are continuously in contact with an external fluid bath.

Claim 9 has been amended to clarify that apertures are defined in the channel for providing continuous fluid communication between the channel and a reservoir.

The amendments are supported throughout the specification. No new matter is added.

Claim Rejections

Claims 1 – 5 and 9 were rejected under 35 USC 102(b) as being anticipated by US 2003/0015425 (Bohm et al.).

Examiner states that Bohm's second fluid sample 18 (Bohm Fig. 17) is *in contact* (as required by Claim 1) with apertures 17 because droplets 19b ejected from sample 18, land in apertures 17.

In fact, the droplets do not render second fluid sample 18 in contact with apertures 17 any more than a pitcher and catcher are in contact by virtue of one throwing a ball to the other.

To remove any possible confusion, Claim 1 has been amended to clarify that apertures are *continuously* in contact with an external fluid bath – a condition that cannot be met by intermittent droplets.

Similarly, Claim 9 has been amended to clarify that apertures are defined in the channel for providing *continuous* fluid communication between the channel and a reservoir – a condition that cannot be met by intermittent droplets.

Claims 2 – 5 depend from Claim 1.

Conclusion

In conclusion, and in view of the amendments and remarks, it is respectfully submitted that all claims are now in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

/mu/

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